

## WHAT IS CLAIMED IS:

### 1. A wheel-and-tire apparatus comprising:

- (a) a wheel-and-tire assembly comprising an inboard rim and an outboard rim, plus an  
5 inboard tire and an outboard tire mounted on said inboard and outboard rims  
respectively, said rims being jointly rotatable about a common axis, and said  
assembly being mountable on a wheel hub of a motor vehicle;
- (b) tire diameter adjustment means, adapted to selectively introduce compressed air into,  
or to exhaust air out of, a designated tire selected from said inboard and outboard  
10 tires, while the wheel assembly is rotating;
- (c) an actuator associated with the tire diameter adjustment means;
- (d) a computer having a memory;
- (e) one or more sensors, each sensor being adapted to be able to measure a selected  
operational parameter of the vehicle, and each sensor having a sensor communication  
15 link for conveying sensor signals, corresponding to measurements made by the  
sensor, from the sensor to the computer; and
- (f) an actuator communication link, for conveying actuation signals from the  
computer to the actuator;

wherein:

- (g) a tire configuration protocol is stored in the computer memory, said protocol  
20 comprising selected optimum tire configurations corresponding to selected sensor  
signals or combinations of sensor signals, said protocol including the tire  
configurations wherein:

- g.1 only the inboard tire is in operatively-effective contact with the road surface;
- g.2 only the outboard tire is in operatively-effective contact with the road surface; and
- g.3 both tires are in operatively-effective contact with the road surface;

5 (h) the computer is adapted and programmed:

- h.1 to receive a sensor signal or signals through the sensor communication link or links;
- h.2 having reference to the tire configuration protocol, to select a tire configuration corresponding to the received sensor signal or combination of sensor signals; and
- h.3 to transmit a corresponding actuation signal to the actuator, through the actuator communication link; and

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- (i) the actuator is adapted to actuate the tire diameter adjustment means, in response to and in accordance with an actuation signal from the computer, so as to inflate or deflate the designated tire as necessary to deploy a selected one or both of the tires in operatively-effective contact with the road surface, in accordance with the selected tire configuration.

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2. The apparatus of Claim 1, wherein the operational parameter measured by each sensor is selected from the group consisting of vehicle speed, acceleration, engine speed, braking load, steering input, steering load, engaged transmission gear, tire pressure, tire temperature, and shock absorber load.

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3. The apparatus of Claim 1, wherein the designated tire is the inboard tire.

4. The apparatus of Claim 1, wherein the designated tire is the outboard tire.

5. The apparatus of Claim 3, wherein the tire diameter adjustment means is further adapted to selectively introduce compressed air into, or to exhaust air out of, both the inboard tire and the outboard tire, while the wheel assembly is rotating, so as to selectively inflate or deflate both the inboard and outboard tires as necessary to selectively deploy both tires, only the inboard tire, or only the outboard tire in operatively-effective contact with the road surface, in accordance with the selected tire configuration.

6. The apparatus of Claim 1, wherein:

- (a) the computer further comprises means for transmitting wireless signals;
- (b) the actuator further comprises means for receiving wireless signals; and
- (c) the actuator communication link is a wireless connection.

7. The apparatus of Claim 1, wherein:

- (a) at least one of the sensors further comprises means for transmitting wireless signals;
- (b) the computer further comprises means for receiving wireless sensor signals; and
- (c) each sensor communication link associated sensors having wireless transmission means is a wireless connection.